

REMARKS

Claims 2-4 and 26-40 remain pending, several of which are being amended. Two paragraphs of the specification are being amended to provide the publication and patent numbers of referenced applications. A typographical error is being corrected in another paragraph of the specification.

Claim Rejections Under 35 U.S.C. §112

Claims 2-4, 28-30 and 36-40 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. It is alleged (Office Action, pages 3-4) that the present application specification fails to disclose determining, *in advance* of writing data, a proportion or fraction of a number of units of the data that are to be stored in a particular memory cell block. This rejection is respectfully traversed.

Paragraph 0074 (line 7) of the present application, as filed, refers to a “predetermined number” of pages as a criterion used for deciding whether to write data to the E1 block. Paragraph 0076 also references the “predetermined number” (line 7) as well as a “present (sic) number” (line 3) of pages being updated as a criterion for selecting a block into which the data are to be written. A “predetermined decision level” is used in paragraph 0067 (line 2) to refer to the number of pages that causes data to be written to the E2 block. And paragraph 0065 (lines 11-14) states that the “number” can be “stored as a system parameter,” which indicates a high degree of permanence. Further, original application claims nos. 5-7 and 10 each use the term “predetermined” to refer to this criterion, the same limitation to which the third Office Action in this case contends for the first time is unsupported by the application disclosure.

For these reasons, it is respectfully submitted that the present application contains a written description of determining or setting the number criterion in advance of using the number to decide the block into which particular data are to be written.

Claim Rejections Under 35 U.S.C. §102 and 35 U.S.C. §103

Claims 2-4, 28, 29, 31, 32, 34, 36, 38 and 40 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. patent application publication No. 2002/0099904 A1 to Conley

(hereinafter “Conley”). Claims 26, 27, 30, 33, 35, 37 and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Conley as applied to claims 2 and 28 above, and in further view of U.S. patent application publication No. 2002/0034105 A1 to Kulkarni et al. (hereinafter “Kulkarni”).

“Proportion” and “Fraction”

One of the main issues in this case, which affects all of the pending claims, is summarized in the Office Action (page 18, line 9 – page 19, line 9). This is actually an issue of claim interpretation. The issue is the scope of the claimed “proportion” and “fraction.”

The position is taken in the Office Action (page 15, line 13 – page 15, line 4) that a “proportion” (claims 2-4, 26 and 27) of a given number includes 100% of that number. Claim 2 is being amended to leave no doubt that “the pre-set proportion” is “less than the given number.” And its dependent claims 26 and 27 specify specific ranges that are less than 100% of the given number.

Similarly, a “fraction” (claims 28-40) of the given number appears to be considered in the Office Action to include 100% of that number. These remaining claims are not being amended further because there seems to be no doubt that by common usage, a “fraction” of something is not considered to include 100% of that something. One dictionary definition for “fraction” is “A small part; bit: *moved a fraction of a step.*” (Emphasis in original) The American Heritage Dictionary, Second College Edition, Houghton Mifflin Company, 1982. Another is “2. *Math.* A quantity less than a whole number, expressed as a decimal (0.3) or with numerator and denominator (3/10).” (Emphasis in original) Funk & Wagnalls Standard Desk Dictionary, Thomas Y. Crowell, 1980. The present application (paragraph 0065) gives a low of 25 percent and a high of 75 percent as examples of fractions of the given number.

It is therefore respectfully submitted that the terms “proportion” and “fraction” of a given number, as used in the present claims, do not include 100% of that number. As a result, the distinction given in the last response (Amendment, November 21, 2007, page 12, lines 2-11) over Conley is present in the rejected claims. Conley does not suggest use of such a criterion for selecting the block of memory cells to receive particular units of data. There is no step in the process of selecting a block to write data that utilizes the claimed criterion. Conley’s steps 61 and 67 of his Figure 14 determine whether there is a block with enough capacity for the amount

of data to be written. The criterion of whether the amount of data with consecutive logical addresses is above or below a “pre-set proportion” or “pre-determined fraction” of the capacity of the block (“given number”), *i.e.* a set number less than 100% of the block capacity, is not used by Conley as part of the block selection process.

All of the claims are therefore submitted to be patentable over Conley for these and the other reasons advanced in Remarks in the last responsive Amendment, filed November 21, 2007, to the same grounds of rejection as repeated in the current Office Action

Plurality of Host Commands

Independent claims 2 and 28 additionally recite that the number of units of data which are compared with the pre-determined number are received by the memory system with a plurality of successive host commands. In response to this being pointed out in the last responsive Amendment, the current Office Action (page 16, lines 5-15) takes the position that this is not novel over Conley. But the discussion in the Office Action ignores that the process occurs for a plurality of units of data “that have sequential logical addresses.” That is, it is the number of units of data having sequential logical addresses that is compared with the pre-determined number when making the decision whether those data are to be written into the designated block or not. Claims 2-4 and 26-30 are therefore submitted to be patentable for this additional reason.

Non-Obviousness

There is the further issue of the obviousness of dependent claims 26, 27, 30, 33, 35, 37, 39 and 41 over a combination of Conley and Kulkarni. Kulkarni describes filling 50% of a buffer RAM memory block with a small amount of the data of a very large file before that data are transferred from the RAM to non-volatile memory. Rather than requiring a 10 Mb RAM for use in creating a 10 Mb image file in non-volatile memory, one of its examples, one or more RAM blocks that individually have a capacity equal to that of a 64 Kb non-volatile memory block size are provided. After one-half of a RAM block is filled with the portion of the large data file, that data are then written to the flash memory.

A further explanation given in the Office Action (page 17, lines 8-19) of the original basis (Office Action, page 14) for the obviousness rejection. It is now understood that Kulkarni is being cited for having made it obvious “to impose a 50% allocation limit of data blocks,” meaning that rather than filling up a Conley block to its capacity, the block “would be written to

the 50% allocation limit.” (Office Action, page 17, lines 14-16.) Or, stated somewhat differently, the rejection is understood to be based on the alleged obviousness of imposing a data storage limit of 50% of their capacity on some of Conley’s blocks.

Based on this understanding, such a combination of Conley and Kulkarni would not meet the terms of the claims. The claims do not impose a limit on how much data an individual block may hold. Rather, it is the number of units of data having sequential logical addresses that is compared with a fixed number, namely a pre-set or pre-determined proportion of the data storage capacity of the individual blocks. If less than this proportion, the data are written to a block designated or allocated to receive such small data writes. This improves the performance of the memory system, as described in the present application.

In addition, it is not seen that Kulkarni describes filling up non-volatile memory blocks as defined in the present application claims with only 50% of their capacity, a fact alleged as a basis for the obviousness rejection. Kulkarni’s memory block is defined to “represent a minimum size of data that can be written to the flash memory 132 during a write procedure.” (Kulkarni, ¶ 0034, lines 6-8; see also ¶ 0012, lines 1-3, and ¶ 0015, line 3.) However, the block is defined in the present claims as the minimum number of cells that are simultaneously erasable. Kulkarni’s block is similar to the page defined in the present application as a unit of programming (see ¶ 0008 of the present application), with many pages included in each of the present application’s block. A scan of the text of Kulkarni reveals that the word “erase” is not even present, so we do not know anything about Kulkarni’s unit of simultaneous erase. Kulkarni’s block of memory cells is a unit of programming, while the block of the present application claims is a unit of erase. These are not at all comparable. It is because a complete block of memory cells is erased before data are written into even a small portion of the block that creates the challenge in managing operation of flash memory that is met by the present invention. Kulkarni is not even remotely concerned with such a challenge.

Also, it is not clear that Kulkarni discloses filling up its non-volatile memory blocks to only 50% of their capacity. Data are written to a non-volatile memory block from an equal sized buffer RAM memory block when the RAM block is 50% full but this does not compel the conclusion that only 50% of the non-volatile memory block is used. This would certainly be wasteful of non-volatile memory capacity, resulting in not using about one-half of the memory.

Indeed, writing into only 50% of a non-volatile block violates Kulkarni's constraint that "The memory blocks 140 represent a minimum size of data that can be written to the flash memory 132 during a write procedure." (Kulkarni, ¶ 0034, lines 6-8.) Nor is it clear that only 50% of the RAM block is used, since Kulkarni only states that the 50% point is when data are then written from the RAM into the non-volatile memory. One way to reconcile this apparent contradiction is to consider Kulkarni as beginning the transfer of data from the RAM block to the non-volatile memory block when the RAM block becomes about 50% full, with this transfer continuing as the RAM block continues to receive data. Kulkarni is certainly not clear on how its flash memory blocks are used.

In any event, Conley and Kulkarni describe different techniques for operating non-volatile memory that address different problems to be overcome. Conley's goal is to improve memory performance by avoiding copying unchanged data from one block to another, and to avoid the need to change a flag or other data in the pages of a block containing the original unchanged data. (see Conley, ¶ 0008, for example.) Kulkarni's goal, on the other hand, is to minimize the size of buffer RAM memory that is necessary to store large amounts of data of an image. (see Kulkarni, ¶ 0013, for example.) These different goals are reached by different memory system operations. It is therefore not understood how one of ordinary skill would have found it obvious to combine their independent features.

Summary and Conclusion

The Office Action repetitively references the flowchart of Figure 14 of Conley as anticipating many of the claimed features. But it needs to be emphasized that there is no step included in that flowchart, when selecting block into which incoming data are to be written, that asks whether the number of units of incoming data with sequential logical addresses is either less than or greater than a pre-set or pre-determined proportion of the given number of units that may be stored in a block (its capacity). Kulkarni does not suggest adding this selection criterion, as claimed herein, to Conley, since Kulkarni is directed to minimizing the size of a buffer memory rather than being directed to overcoming the limitation of having to erase all of a non-volatile memory cell block before any of a plurality of data units may be written into it.

Accordingly, it is believed that this application is now in condition for allowance and an early indication of its allowance is solicited. However, if the Examiner has any further matters that need to be resolved, a telephone call to the undersigned attorney at 415-276-6534 would be appreciated.

FILED VIA EFS

Respectfully submitted,



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